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ASTRONAUTICS AND SPACE EXPLORATION

HEARINGS BEFORE THE SELECT COMMITTEE ON ASTRONAUTICS AND SPACE EXPLORATION EIGHTY-FIFTH CONGRESS SECOND SESSION ON H. R. 11881

APRIL 15, 16, 17, 18, 21, 22, 23, 24, 25, 28, 29, 30, MAY 1, 5, 7, 8,
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Exploration



ASTRONAUTICS AND SPACE EXPLORATION

WEDNESDAY, APRIL 16, 1958

HOUSE OF REPRESENTATIVES,
SELECT COMMITTEE ON ASTRONAUTICS AND SPACE EXPLORATION,
Washington, D. C.

The committee met, at 10 a. m., pursuant to recess, in the Caucus Room, Old House Office Building, Hon. John W. McCormack (chairman) presiding.

Present: Representatives McCormack (chairman), Brooks, Metcalf, Natcher, Sisk, Arends, McDonough, Fulton, Keating, and Ford.
Present also: George J. Feldman, Director and Chief Counsel.

The CHAIRMAN. The committee will be in order.

The next witness is Lt. Gen. D. L. Putt, Deputy Chief of Staff for Headquarters, United States Air Force.

We are very glad to have you here before us, General Putt. You may proceed.

STATEMENT OF LT. GEN. D. L. PUTT,⁴ DEPUTY CHIEF OF STAFF FOR DEVELOPMENT, HEADQUARTERS, UNITED STATES AIR FORCE; ACCOMPANIED BY DR. HUGH L. DRYDEN, DIRECTOR, NATIONAL ADVISORY COMMITTEE FOR AERONAUTICS, AND PAUL G. DEMBLING, GENERAL COUNSEL OF NACA

General PUTT. Thank you, Mr. McCormack.

Mr. Chairman and members of the committee: It certainly is a pleasure for me to appear before your committee today. I am honored that you have seen fit to solicit my views in this important initial phase of your operation.

As I understand the situation, your immediate purpose is to establish a general framework for your overall investigation of space research and exploration and to identify the major problems involved.

Later, I see from your schedule, that you will call Air Force technical experts like General Schriever, who heads up the Air Force ballistic missile and satellite programs, and General Keirn, who is my top staff assistant for nuclear matters.

Likewise, General Boushey for astronautics, and perhaps others like Dr. Strughold from the Air Force Space Medicine Laboratories.

Therefore, I will leave the details to them and keep my remarks in a more general vein.

⁴ Putt, Donald L(eander), air force officer; born Sugarcreek, O., May 14, 1905; s. Harry Edwin and Lucy Hollis (Preslar) P.; B. S. in elec. engring., Carnegie Inst. of Tech., 1928; M. S. in aeronautical engring., Calif. Inst. of Tech., 1938; Air Corps Engring. Sch., 1936-37; m. Margaret Wile Yent, Dec. 27, 1933; 1 son, William Donald. Enlisted July, 1928; commissioned 2d. lieut., 1929; advanced through grades to maj. gen., 1949; stationed with 1st pursuit group, Selfridge Field, Mich., 1929-33; flight test pilot, Wright Field, 1933-36, chief bombardment branch, Engring. Div., 1938-45, dep. comdg. gen., Intelligence, Air Materiel Command, 1945-48, dep. chief, engring. div., 1948-49, dir. Research and Development, U. S. Air Forces, 1948-52; v. comdr., Air Research and Development Command, U. S. A. F., 1952-53, comdr., 1953-54; dep. chief of staff, development, Hdqrs. USAF, 1954-; dir. tech. services, Air Tech. Service Command, Europe, 1945. Decorated Legion of Merit with Oak Leaf Cluster; Bronze Star Medal with Oak Leaf Cluster; Croix de Guerre with Palm (France). Mem. Inst. of Aero. Scis., Nat. Adv. Com. for Aeronautics, Nat. Inventors Council, Sigma Alpha Epsilon, Tau Beta Pi, Theta Tau, Eta Kappa Nu, Sigma Xi, Scabbard and Blade. Home: Quarters 68, Bolling Air Force Base, Washington. Office: Hdqrs. USAF, Washington 25.

Dryden "out of cannon"
House testimony
April 1, 1958
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Do you know why he was not authorized to proceed?
General PUTT. No, I do not. The Air Force, likewise, has a program somewhat similar to that, a little different in scope.
Dr. DRYDEN. May I step in where angels fear to tread?
I feel there are something like 200 projects to put a man in space originating with various groups in the United States. They range all the way from tossing a man up in the air and letting him come back—which, to my mind, is about the same technical value as the circus stunt of shooting the young lady from the gun—to projects where he remains in the satellite for several orbits.
Now, the great problem of the people concerned with this, and I am glad that I do not at present, at least, have the responsibility, is to pick which ones of these 200 projects is to be supported.
That is all.
The CHAIRMAN. Mr. Fulton?
Mr. FULTON. We are glad to have you here, General. I am sorry to know that you are retiring. Are you not under age for retirement?
General PUTT. I believe not. From the standpoint of compulsory retirement for age, you are correct. However, I have completed 30 years of service.
Mr. FULTON. There is some good yet and why do you not stay in? Are you leaving because of any possible holdback by the Air Force on any of your ideas and you might get a broader field outside to express them?
General PUTT. Absolutely not. I am not retiring because I am angry with anyone or in protest of anything.
Mr. FULTON. But looking for a broader field? I did not put the word "angry" into that.
General PUTT. Not necessarily looking for a broader field. I do not know of any particular industry, or position that one might hold, that gives one the opportunity to look as broadly as does the position I hold in the Air Force.
Mr. FULTON. I believe the Congress has the policy of trying to encourage the young fellows with ability to remain with the Air Force.
General PUTT. That might be an element in my retiring so that the youngsters can take over.
Mr. FULTON. We think you are young enough and competent enough so that we would like you to stay.
Let us go further. The problem comes up with the development of the million-pound-thrust engine. Are you familiar with that and the effort to try to obtain a million-pound-thrust engine in the near future?
General PUTT. Yes, sir.
Mr. FULTON. You also know that to date, on studies, the amount spent has been about a half million dollars. Is that not right?
General PUTT. That is approximately correct.
Mr. FULTON. What would your estimate be of the total cost of getting a 1-million-pound engine, something between \$40 million and \$200 million?
General PUTT. Let me check our records here to see what it is.
Mr. FULTON. I am only a Naval Reserve officer. What is your estimate in general figures, round terms? Is that the area of magnitude that you would likewise estimate?

This is the order of magnitude. Some studies have been made of vehicle design using such an ion motor. These are paper computations.

Of course, if you make very high jet velocities, say, you made the ions go very fast, the energy requirements are very large, you have to have a much bigger source of power.

So, such studies have shown that the acceleration that could be obtained by ion propulsion in a space vehicle might be as low as 10 to the minus 50 times gravity.

One one-hundred-thousandth of gravity. It is obvious, since to take off from the earth you have to have a force greater than the surface gravity, that an ion system is of no use in the early stages of flight. In fact, a little computation will show you it is no use at all until you get a half million miles away from the earth. You really get out well on the way toward Mars.

For this reason, we do not have any crash projects to develop ion-propulsion powerplants. They will not be needed for some time. This subject will remain in the research stage.

We, and others in the business, will try to invent new ideas that will reduce this weight for a given thrust.

You, perhaps, have also heard about the so-called use of solar power with the photon sail. Again a few simple computations will show you that for 10 pounds thrust you need a sail which has an area of 50 million square feet. That is quite a sail, and that sail will weigh 75 tons, even though it is made of very thin foil material much thinner than the foil of these balloons.

I bring this out simply to try to show something, instead of words, to show you that these ideas which men are thinking about are not something that justify jumping immediately into a program to develop engines. None of these will be of any use until we are out a half million or a million miles from the earth.

This, I think, is all of the prepared statement I wish to make, Mr. Chairman, and now I am ready for questions.

The CHAIRMAN. Dr. Dryden, you know about the statement made by Dr. von Braun that one of the projects about propelling a man into space about 150 miles and bringing him back, and you made some kind of an off-the-cuff, I assume, observation about shooting a young lady from a cannon.

Dr. DRYDEN. Yes, sir.

The CHAIRMAN. Do you want to amplify that, or clarify it, or explain it, or anything you want?

Dr. DRYDEN. I think I should amplify the statement.

The remark, of course, dealt with the problem that there were a large number—I said 200; I hope you don't ask me to write down 200—I see my friend Jim Dempsey said on television 60 projects to get a man into space. There might be 60, but I might have trouble getting 200.

I mentioned this to show the great number and variety of proposals, ranging from the very simple proposals to those of actually putting man into a satellite orbit.

The simplest experiment which has been proposed by many people, and at least two people in my own organization tried to interest me in going ahead with such a program—there have been many proposals for this simple experiment is using the boosters that will be available

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very shortly to toss a man vertically upward and then to recover him by the use of parachute or equivalent device.

Now, scientifically this gives you one result. It gives a period of weightlessness for the man of a few minutes, as compared to a little less than a minute that we now get in flying airplanes in a curved path.

Conceivably, there are certain items of equipment that could be tested. This simple experiment, however, does not throw light on the most difficult and key problem of the man in space, which is getting him back from space or satellite orbit safely. In this latter case, we have to begin with a speed of about 18,000 miles per hour.

Many computations have shown, even Russian computations which we have seen have shown, that this can be accomplished without burning the vehicle up only by entering at a very flat angle, a few degrees from horizontal, coming in, and spiraling down. It is not possible to reenter the atmosphere vertically from satellite speeds or from space.

In vertical probe, the man and his container come to rest with respect to the earth, and then he falls freely and, depending on the altitude to which you propel him, he will reenter at speeds of 1,000, 2,000, or 3,000 miles per hour. These conditions are quite different from the reentry from a satellite vehicle, so that this experiment does not give you information along that line.

The estimates of cost vary. What I have said, and I don't change the statement, is that this simple experiment standing alone as an objective, to me, is not of very much greater value than the shooting of a lady from a cannon. It does give you a little scientific information at a great deal of cost. It may be justified as part of a very comprehensive program.

Dr. von Braun and General Medaris are people that I have a great deal of respect and admiration for. They have outlined a comprehensive program of space exploration with a cost estimate of a half billion to a billion dollars, as I recall it. Whether this simple experiment can be really justified as part of that more comprehensive program is something which should be studied as to whether the results obtained are worth the cost.

A simple extension of this kind of experiment tosses a man like a ballistic missile and does simulate a lower part of the recovery path of the satellite.

Although that is a somewhat more difficult problem, it might be that this is the place to begin. In any case, as I said in my statement, I think this must be preceded by a thorough testing out of the vehicle before we put the man in it.

The CHAIRMAN. No question but what they feel the same way.

Dr. DRYDEN. Yes. My statement was not directed in criticism of any specific program, but was intended to illustrate the wide variety of simple experiments, which give you little information, to much more complicated and costly experiments which give you a great deal more information.

The CHAIRMAN. Some people thought, assuming an agency were established and you were appointed the Director, the head of it, that it might indicate the state of your mind on your part where you are more wedded to the past activities of your organization than the future activities.

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The remarks made last week with reference to the wide variety of proposals to place a man in space have been interpreted as an attack on one specific proposal. The simplest type of experiment is usually called a vertical probe. A capsule is fired vertically as high as it will go. Rocket motors now available or soon to be available can be used to propel a capsule containing a man to high altitude. Recovery of the man will be made by some form of parachute. Two such proposals were submitted to me by NACA staff members and there have been many similar proposals from other sources.

The single scientific problem that can be studied in such flight is that of weightlessness, which will be experienced for several minutes as compared to 40 seconds in present airplane experiments. Use of the vertical probe will provide little information bearing on the key and most difficult problem of man in space, namely recovery from space or satellite orbit. Such recovery begins at a speed of 18,000 or more miles per hour. Many calculations, including Russian ones, show that under such conditions recovery must begin along a path inclined a few degrees to the horizontal.

On the other hand, the vertical probe starts its return to earth from zero speed at high altitude and enters the atmosphere vertically at speeds less than a few thousand miles per hour. Thus, a vertical probe test, standing alone, makes a limited contribution toward placing man in a satellite orbit.

The vertical probe experiment is only one part of the complete program prepared by Dr. von Braun and General Medaris. The entire

The vertical probe experiment is only one part of the complete program prepared by Dr. von Braun and General Medaris. The entire program is estimated to cost from one-half to one billion dollars. Such comprehensive programs have also been proposed by others. I have the greatest respect and admiration for Dr. von Braun and Gen. Medaris and I am delighted that Dr. von Braun is one of the present advisers of NACA serving as member of the NACA's Special Committee on Space Technology.